5-28-2014

Count Like an Egyptian: A Hands-On Introduction to Ancient Mathematics (Book Review)

Calvin Jongsma
Dordt College, calvin.jongsma@dordt.edu

Count Like an Egyptian: A Hands-On Introduction to Ancient Mathematics (Book Review)

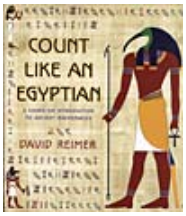
Abstract
Reviewed Title: Reimer, David. *Count LIke an Egyptian: A Hand-On Introduction to Ancient Mathematics.* Princeton, NJ: Princeton University Press, 2014. 237 pages. ISBN 9780691160122

Keywords
book review, Count Like an Egyptian, David Reimer, history of mathematics

Disciplines
Mathematics

Comments
- http://www.maa.org/publications/maa-reviews/count-like-an-egyptian-a-hands-on-introduction-to-ancient-mathematics

Count Like an Egyptian: A Hands-On Introduction to Ancient Mathematics



David Reimer

Publisher: Princeton University Press
Publication Date: 2014
Number of Pages: 237
Format: Hardcover
Price: $29.95
ISBN: 9780691160122
Category: General
BLL Rating: BLL

The Basic Library List Committee suggests that undergraduate mathematics libraries consider this book for acquisition.

MAA REVIEW | TABLE OF CONTENTS

[Reviewed by Calvin Jongsma, on 05/28/2014]

Count Like an Egyptian is a beautifully illustrated and well-written book with a small axe to grind. Ancient Egypt is the main focus; counting, not so much. Reimer's overriding goal is to demonstrate that Egyptian fraction arithmetic is fascinating, versatile, and well suited for whatever calls fractions into existence. By the end of the book, one still may not agree with Ahmose, the copyist of the Rhind Mathematical Papyrus (RMP) circa 1650 BC, that "Accurate Reckoning" with Egyptian fractions is "the entrance into the knowledge of all existing things and all obscure secrets." But by working through the material Reimer patiently and gently presents, the reader will have a more thorough understanding and appreciation of how Egyptian scribes made the calculations needed to administer an empire bent on building pyramids and granaries, surveying flooded riverside property, digging irrigation basins, and rationing or exchanging bread and beer supplies amongst its gangs of workers.

Egypt had two numeration systems for whole numbers, hieroglyphic and hieratic, and each was adapted to treat fractions. Both are additive base-ten systems with a limited fund of distinct numerals. The hieratic system was a more concise ciphered version of the hieroglyphic system; it was the one scribes used when brushing ink on pottery, papyrus, or leather. Hieroglyphic is easier to read, however, so Reimer follows the usual practice of using it to exhibit Egyptian numerals (Chapter 1). When he begins discussing Egyptian computation procedures, though, he, like others, takes the next step of substituting our base-ten place-value numerals for theirs to help us concentrate on the algorithms rather than the symbols. Thus far, Reimer's text agrees with what one can find in most books on Egyptian mathematics.

Egyptian fractions, according to Reimer, are another matter. While they, too, are treated (with different degrees of attention) by various history of mathematics texts, Reimer found the ones on his shelf unhelpful and misguided. Working through the problems of the RMP much as he imagined an Egyptian scribe might, Reimer eventually came to intuit and enjoy the sorts of maneuvers used in their solutions. He concluded that Egyptian fraction arithmetic, which is restricted to unit fractions along with one unit-fraction complement (2/3), had been given a bad rap as being tedious, complicated, and primitive in comparison with that of other cultures — especially our own. In this book, Reimer argues for its beauty, insight, and creativity.

The core of the book (Chapters 2–5) explains in detail how fractions are symbolized, added and simplified, completed to give larger amounts, multiplied, and divided. Key strategies and techniques peculiar to fraction arithmetic are identified along the way — calculating by parts (a common denominator method), switching and reciprocating, and using tabulated results to double and condense fraction sums.

While Reimer may have learned these computational methods largely on his own from the RMP, they will not be new to someone familiar with the scholarly primary and secondary sources produced over the last century and especially since the 1970s. Reimer doesn't identify his resources, and he also fails to provide the reader with a bibliography for pursuing the topic further. This latter omission may befit the popular character of the work, but it leaves the reader with a false impression of the current state of historical scholarship. Earlier historians of mathematics often traced all significant mathematics back to the Greeks and treated the Egyptians as not really worth studying, but this is hardly the case today. Notwithstanding this reservation, Reimer presents Egyptian fraction mathematics in an attractive package.

Egyptian mathematics can be captivating, once one is willing to engage it on its own terms instead of looking at it for precursors to ideas or techniques in current-day arithmetic or algebra or geometry. It has a different character than modern mathematics, but it was obviously well suited for handling the quantitative needs of the Egyptian Empire. Its existence demonstrates that other forms of mathematics besides ours flourished and were found quite satisfactory in their own time and place. Substantiating this is where Reimer's work shines. He obviously loves what he has uncovered, and he shares his discoveries with his readers with light-hearted humor and pedagogical skill.

In the process of developing technical facility with Egyptian fractions, the reader is introduced to other features of Egyptian mathematics (some basic measurement geometry —areas of triangles, trapezoids, and circles, and volumes of boxes, cylinders, and truncated pyramids; some simple problem solving — using the method of false position for homogeneous linear problems) and also to the rich cultural matrix in which this all took place (Egyptian religion and mythology; economic and political conditions). At times the connection between Egyptian life and Egyptian mathematics is rather tenuous, as Reimer realizes, but the overall effect is to give the reader a good sense of the situated character of the mathematics being developed and used.

Reimer does a good job of helping the reader understand the nature, scope, and serviceability of Egyptian fraction arithmetic. But he isn't content to stop there. In order to redeem its prestige, he champions its effectiveness and efficiency by comparing it with standard place-value systems of fraction calculation.

His main comparison is to the contemporaneous sexagesimal system of Mesopotamian culture (Chapter 7), a system similar to ours. Using the calculation 5,784 ´ 12,497 = 72,282,648 as his illustration, Reimer shows that Egyptian mathematics more than holds its own: the sexagesimal computation is long and tedious. However, in the process, he disadvantages the Mesopotamian system by sticking with their cuneiform symbols while freely using our numerals for the Egyptian system. If the latter calculation were done using either hieroglyphic or hieratic numerals, the process would be much less efficient or more complex because of the time and space it takes to draw repeated symbols or determine the doubles of ciphered numerals — not to mention the embarrassing fact that the final product can't even be expressed with Egyptian numerals because it's too large! A similar problem (recognized earlier by Reimer) is that certain fraction calculations may lead to fractions having denominators too large to be located in the tables available to an Egyptian scribe.

Reimer does have a point, though. Texts often disparage Egyptian fractions while commending Mesopotamian sexagesimal fractions for being similar to our own decimal fractions. This is usually done without taking the time to explore how each system actually works. Egyptian fraction representations, Reimer argues (Chapter 8 and passim), can be used both to provide good estimates and to give exact answers to problems involving fractions. Sexagesimal (and decimal) fractions, on the other hand, are at a distinct disadvantage in working problems such as 2 ÷ 7 because no exact terminating answer results. We compensate for that today by using an overbar (awkward for doing further computation) or by using common fractions instead, but the Egyptians were able to function well with just a single system. Even granting this (and the earlier) shortcoming of Mesopotamian arithmetic, readers may still find Reimer's accusation that those who prefer the "enlightened" sexagesimal system over the "awkward" Egyptian system either have "no clue what they're talking about" or are "ignorant, liars, or just plain insane" a bit over the top, even if offered as tongue-in-cheek hyperbole.

Reimer's advocacy of Egyptian fraction arithmetic is entertaining and contagious. The lure arises, I think, first of all from the material itself. Like him, I have long been fascinated by how Egyptian scribes work with fractions — they have a wonderfully different approach, showing how much can be done with a limited supply of basic mathematical materials. I explore this topic both in teaching history of mathematics (when I look at Egyptian mathematics) and in teaching prospective middle school mathematics teachers (when I explore the meaning, symbolism, and arithmetic of fractions from a historical perspective). With *Count Like an Egyptian*, I now have an accessible learning resource to which I can refer students who want to work through this material in more detail or at their own pace with an experienced guide. The book contains about two dozen typographical errors, but these can be readily corrected by the reader on the fly.

While obviously a niche text, this book should find a home in libraries used by middle school and high school

mathematics teachers. It also provides a good resource for mathematics education professors and their students on the college level as they explore historical beginnings of mathematical ideas, make cultural comparisons, and develop interdisciplinary connections.

Calvin Jongsma is Professor of Mathematics Emeritus (semi-retired) at Dordt College in Sioux Center, IA. His email address is Calvin.Jongsma@dordt.edu.

Tags: History of Mathematics
Non-Western Cultures

Log in to post comments

Mathematical Association of America
P: (800) 331-1622
F: (240) 396-5647
E: maaservice@maa.org